**Testimony**
**Before the Subcommittee on Oversight and Investigations of the Committee on Energy and Commerce, United States House of Representatives**

# THE IMPLEMENTATION OF GEOSS: A REVIEW OF THE ALL-HAZARDS WARNING SYSTEM AND ITS BENEFITS TO PUBLIC HEALTH, ENERGY AND THE ENVIRONMENT

*Statement of*

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**For Release on Delivery**
**Expected at 2:30 PM**
**Wednesday, March 9, 2005**

Good afternoon. I am Dr. Allen Dearry, Associate Director for Research Coordination, Planning and Translation at the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health, DHHS. NIEHS is a member of the Interagency Working Group on Earth Observations. I am pleased to be here to present testimony on the benefits to human health and well-being from the interagency initiative to develop the U.S. component of a global Earth observation system of systems (GEOSS). GEOSS will be a means of bringing useful health-related environmental data to the health communities (researchers, service providers, and policy makers) in a user friendly form. Comprehensive data sets are powerful tools that support prevention, early warning, research, epidemiology, health care planning and delivery, and provide a variety of timely public alerts.

At its most fundamental level, this activity acknowledges the critical role that the availability of comprehensive and sustained global observations plays in enabling our understanding of the earth and its many interconnected systems—oceans, atmosphere, land, and man-made constructs such as cities. Only by fully exploring and understanding the relationships between natural and man-made environments will we be able to implement holistic, ecosystem-based management and provide simultaneously for a productive economy, sustainable development, and protection of human health and well-being.

Health status is determined by the interplay of a complex array of factors--genetic susceptibility, age, nutrition, stress, and environmental exposures. With the sequencing of the human genome, rapid progress in understanding the role of human genetic susceptibility in disease causation and progression is expected. Continued improvements in quality of life and longevity will require a better understanding of the causes, development, and progression of common diseases and disorders—and how they relate to environmental factors. For example, what are the specific environmental factors underlying burgeoning increases in vector-borne diseases, such as malaria and West Nile virus, and chronic diseases already linked to environmental exposures, such as breast cancer, Parkinson's disease, and asthma? How can we improve prediction of outbreaks of both acute and chronic diseases? A well-designed, coordinated global earth observation system of systems (GEOSS) would contribute significantly to providing data and data products on many environmental factors that influence human health, from extreme weather events, to availability of food, to air and water pollution.

One of the most difficult challenges faced by researchers and policymakers is monitoring and assessment of environmental exposures. To assess exposure adequately, investigators must know as much as possible about the environmental media into which a substance is released (air, surface water, groundwater, soil surface or subsurface), how quickly the substance can move through those media, how physical and chemical properties change under environmental conditions, and how these changes affect the potential for harming populations or the environment. GEOSS will offer improved data and data products to aid in exposure assessment.

Over the past fifty years, an increasing demand for environmental health knowledge to inform personal and societal decision-making has been expressed by service providers, policymakers, and the public at large. The optimal approach to achieve this knowledge base is to combine in situ and remote observations with disease tracking data. Together, this information can be distributed widely, using information systems, and thereby effectively provide tools for the public and for policymakers to make individual and community decisions about daily lives and potential regulations that influence human health and well-being.

Data and data products relevant to human health and well-being that can be obtained from GEOSS include, but are not limited to, the following areas:

- Air quality and pollution transport.
- Water quantity and quality, especially for human use.
- Hot spots of pollution in wetland and coastal areas.
- Fate of pathogens in marine and other low oxygen environments, such as aquifers, mountain tops and caves.
- Fate and transport of chemicals in the terrestrial, aquatic, and marine environments.
- Impact of environmental changes and man-made activities on terrestrial and aquatic biodiversity.

- Search for natural organisms and substances having the potential to be developed as beneficial products of medicinal and commercial value.
- Environmental conditions that influence disease transmission from vectors to humans, including those that affect the spread and control of emerging or re-emerging diseases.
- Safe and adequate supply of food.
- Land use, urban form, population data, and transportation patterns for planning and health impact assessment.
- Human activities and location for exposure assessment and resource management.
- Weather and climate.
- Invasive species, particularly those affecting humans.

All the components of an integrated earth observation system can contribute to improving human health and well-being. Researchers, service providers, policymakers, and the public can use earth observations to make decisions and take actions. These decisions and actions help reduce the impact of disasters, protect and manage natural resources, adapt to and mitigate climate variation, support sustainable agriculture, forecast weather, protect areas valued for recreational, religious, or aesthetic purposes, and prevent disease/dysfunction due to environmental exposures or conditions that increase the likelihood of transmission of water- or vector-borne diseases. For diseases influenced by environmental factors, the enhanced availability of a variety of earth observations will allow the development of improved predictive models that could open the door to

forecasting occurrence and possibly controlling or preventing these diseases in human populations.

Enhanced earth observations that lead to improved data on air quality and an enhanced ability to predict air pollution episodes will contribute to improvements in human health by reducing morbidity and mortality due to asthma, chronic obstructive pulmonary disease, atherosclerosis, myocardial infarction, and other respiratory and cardiovascular diseases. In addition, air pollution affects the environment in many ways that ultimately impact human health and well-being: by reducing visibility; damaging crops, forests, and buildings; acidifying lakes and streams; stimulating the growth of algae in estuaries; and the build-up, or bioaccumulation of toxics (e.g., mercury) in fish and animals. Rapid development and urbanization around the globe has increased air pollution that threatens people everywhere as these contaminants can travel great distances across oceans and national boundaries.

Both the quantity and quality of water on local, national, and global levels pose similar concerns. For example, an annual dead zone has developed in the Gulf of Mexico, beginning as early as February and sometimes lasting until mid-fall. This zone consists of water where the oxygen content is so low that its denizens cannot survive. Although the precise timing and size of the Gulf's dead zone varies with the weather, in many years it encompasses 22,000 square kilometers, a parcel of underwater real estate roughly the size of New Jersey. There's no mystery as to what triggers this annual hypoxic zone. Into the Gulf of Mexico, the Mississippi River deposits water that is heavily enriched with plant

nutrients, principally nitrate. This pollutant fertilizes the abundant growth of algae. As blooms of algae go through their natural life cycles and die, they fall to the bottom and create a feast for bacteria. Growing in unnatural abundance, bacteria use up most of the oxygen from the bottom water. Caused almost exclusively by human activities, coastal dead zones are becoming increasingly common and recurrent. In the Chesapeake, scientists worry that a growing dead zone in the bay each summer is creating a habitat that favors jellyfish over commercially valuable finfish, crabs, and oysters. Despite the nation's most aggressive state and local efforts to curtail nutrient releases into local waters, last year's dead zone in the Chesapeake was the largest ever measured. In addition to economic and social impacts, these changes in marine biology and chemistry affect human health by promoting growth of toxic or harmful algal blooms and decreasing our capacity to obtain reliable, valuable food sources. Improving our ability to measure and monitor land- and water-based environmental change contributing to such outcomes will significantly expand our capability to protect both marine resources and human health.